Contents

Preface xi
Contents xiii

Chapter 1. Basic problems of magnetization processes

Kronmüller, H. and T. Reininger
Micromagnetic background of magnetization processes in inhomogeneous ferromagnetic alloys (*Invited paper*) 1

Barradi, T. and A. Mailfert
Incidence of the dynamic behaviour of the domain walls on the iron losses in grain-oriented Si–Fe sheets using sinusoidal and non-sinusoidal waveform induction 6

Vojtaník, P., J. Degro and D. Macko
Magnetic relaxation of structure and magnetic properties of amorphous $Co_{100-x}B_x$ alloys 9

Bertotti, G., F. Fiorillo and M. Pasquale
Magnetization process and hysteresis in pure iron 11

Allia, P., C. Beatrice, G. Brida and F. Vinai
On the kinetics of viscosity field in amorphous ferromagnets 14

Saito, A., K.-i. Yamamoto and K. Yamane
Decrease of magnetization in positive magnetostrictive material due to tensile stress 17

Honda, A., M. Goktepe, N. Derebasi, T. Meydan and A.J. Moses
Effect of surface roughness and tension on dynamic domain motion in grain oriented 3% silicon iron 20

Meydan, T., N. Derebasi, A. Honda and M. Goktepe
Dynamic domain motion in amorphous materials under applied tensile stress and controlled magnetisation 23

Ivanov, B.A. and S.N. Lyakhimets
New look to the coercivity of the amorphous and nanocrystalline magnetic materials 26

Hattendorf, H. and B. Erpenbeck
Relation between texture and magnetic annealing of a 55% Ni–Fe alloy 29

Wiglasz, V.
Power losses in grain-oriented electrical steels 33

Cruz, S.P., M. Knobel, R. Sato Turtelli, P. Allia and F. Vinai
Variation of the magnetic disaccommodation dynamics in zero-magnetostrictive amorphous ribbons 36

Kisdi-Koszó, É., A. Lovas, J. Kovác, L.K. Varga and É. Zsoldos
Inhomogeneous atomic distribution and its effect on magnetic properties of diluted Fe–TM–B metallic glasses 39

Saito, A., K.-i. Yamamoto and S. Ueda
Reversible and irreversible magnetization changes of amorphous ribbons due to stress 41

Müller, K.-H. and M. Wolf
Magnetostriction of isotropic two-phase materials 44

Lyakhimets, S.N.
Thermodynamic reciprocity of magnetic anisotropy and deformation induced by thermoannealing 47

Chapter 2. Measuring techniques and theoretical reflections

Sievert, J.
On measuring the magnetic properties of electrical sheet steel under rotational magnetization (*Invited paper*) 50

Mivehchi, E., P. Beckley and D.H. Horrocks
A computerised domain observation system for coated Si–Fe sheets using a scanning electron microscope 58

Dubasiewicz, W., K. Jedrzejak and M. Soiński
Magnetic coercivity in consolidated amorphous strips 61

Meydan, T. and R. Hoyle
Computerised three-dimensional magnetic field measurements 64

Mivehchi, E., P. Beckley and D.H. Horrocks
Observation of hysteresis loops from the images of moving domains captured from a SEM 67

Nakata, T., N. Takahashi, K. Fujiwara, M. Nakano and Y. Ogura
Accurate measurement method of magnetization curve using ring specimen 71

Iranmanesh, H., P. Beckley and A.J. Moses
Investigation of a double-sided non-enwrapping 'with' and 'against' power-loss testing system based on the 'flux injection' principle 74

Ling, P.C.Y., A.J. Moses, F. McQuade, W. Grimmond and D. Fox
Investigation of magnetic degradation of wound cores due to adhesive bonding 77

Enokizono, M., T. Todaka, T. Sashikata, J.D. Sievert and H. Ahlers
Magnetic field analysis of rotational loss tester with vertical yoke 81

Wiglasz, V.
Comparison of magnetic measurement on sheets and Epstein samples 85

Ahlers, H., A. Nafalski, L. Rahf, S. Siebert, J. Sievert and D. Son
The measurement of magnetic properties of amorphous strips at higher frequencies using a yoke system 88

Sievert, J., H. Ahlers, M. Enokizono, S. Kauke, L. Rahf and J. Xu
The measurement of rotational power loss in electrical sheet steel using a vertical yoke system 91

Taylor, R.
An on-line grain size measuring system for electrical steels production 95

Iranmanesh, H., B. Tahouri, A.J. Moses and P. Beckley
A computerised Rogowski–Chattock Potentiometer (RCP) compensated on-line power-loss measuring system for use on grain-oriented electrical steel production lines 99

Havlíček, V.
Digitally controlled single sheet tester 103

Zouzou, S., A. Kedous-Lebous and P. Brissonneau
Magnetic properties under unidirectional and rotational field 106

Shirkoohi, G.H. and A.J. Moses
Separation of hysteresis and eddy current components of iron loss in 0.5 mm low-silicon non-oriented steel by the 'distorted wave method' 109

Mikulec, M.
Accuracy of single sheet testers 112

Morino, H., Y. Ishihara and T. Todaka
Measuring method of magnetic characteristics in any direction for silicon steel 115

Ling, P.C.Y., F. McQuade and W. Grimmond
Computer aided measurement of magnetic properties of wound cores 120

Salz, W. and K.A. Hempel
A two-dimensional model describing the magnetic behaviour of textured steel sheet 123

Schönhuber, P., H. Pfützner, Y. Simpson and G.S. Radley
Investigations of Bloch wall mobility in crystalline and amorphous soft magnetic material 125

Ebrahimi, A. and A.J. Moses
Influence of the stacking method on the normal flux transfer from lamination to lamination in grain-oriented 3% silicon–iron samples cut at different angles to the rolling direction 129

Moghaddam, A.J. and A.J. Moses
A non-destructive automated method of localised power loss measurement in grain oriented 3% silicon iron 132

Alinejad-Beromi, Y., A.J. Moses and T. Meydan
New aspects of rotational field and flux measurement in electrical steel 135

Németh, S., C. Kopasz and C. Hargitai
Improvement in indirect magnetostriction measurements 139

Bieńkowski, A.
Some problems of measurement of magnetostriction in ferrites under stresses 143

Chapter 3. Electrical steels and their application

Bertotti, G., F. Fiorillo and P. Mazzetti
Basic principles of magnetization processes and origin of losses in soft magnetic materials (*Invited paper*) 146

Moses, A.J.
Development of alternative magnetic core materials and incentives for their use (*Invited paper*) 150

Schönhuber, P., A. Honda and A.J. Moses
Effect of lamination stacking on static domain structures in grain oriented 3% silicon iron 156

Huneus, H., T. Kochmann, A. Schoppa and H. Wich
Medium alloyed magnetic steel with low core loss and high permeability 159

Hammer, B., C. Riediger, M. Hastenrath and F. Bölling
Interactions between the inhibitor phases, secondary grain growth and glass-film formation in HGO electrical steel 162

Böttcher, A., M. Hastenrath and F. Bölling
The role of subsurface layers for Goss-texture development in RGO-electrical steel 165

Pârvu, G., V. Miron and C. Winckelbauer
Production and research of silicon steel strips in Romania 169

Nakata, T., N. Takahashi, K. Fujiwara, M. Nakano and M. Seno
Magnetic characteristics of magnetic materials at very low temperature and their application to transformers 174

Eadie, G.C.
Continuous sprayforming of electrotechnical steel strip 177

Mirbach, E. and H. Reiche
Cost reduction by application of semi-processed steel in the production of electrical motors 179

Sato, K., M. Kurosawa, B. Fukuda and T. Kan
Investigation of the domain refining effect in grain-oriented silicon steel 183

Wiglasz, V. and P. Pácl
Effect of laser scribing on power losses of conventional grain-oriented electrical steels 186

Bi, X.F., Y. Tanaka and K. Sato
Effect of microstructure on the magnetic properties of 6.5% Si–Fe alloy 189

Okazaki, Y. and K. Ueno
Magnetic shielding by soft magnetic materials in alternating magnetic field 192

Enokizono, M., G. Shirakawa and J. Sievert
Anomalous anisotropy and rotational magnetic properties of amorphous sheet 195

Yashiki, H. and T. Kaneko
Effect of hot-band annealing on anisotropy of magnetic properties in low-Si semi-processed electrical steels 200

Enokizono, M., T. Todaka and K. Kihara
Flux distribution in magnetic core with wound strips of laminations 203

Enokizono, M., T. Todaka and M. Kumoi
Demagnetization and magnetic domain structure of silicon steel sheet 207

Bürger, R., H. Kleine, S. Mager and J. Wieting
New possibilities for semifinished grain-oriented and non-oriented electrical steels 212

Shirkoohi, G.H.
Magnetostrictive properties of non-oriented electrical steel under third-harmonic distorted flux conditions 215

Barrué, R., J.C. Perron, J.C. Bavay and G. Ligi
Correlation between grain orientations and domain structure in industrial grain-oriented Si–Fe sheets (Hi-B) 219

Shirkoohi, G.H. and M. Boukhalfa
Variation of magnetostrictive properties in grain-oriented and non-oriented electrical steel with texture under applied linear stress 222

Pácl, P., V. Wiglasz and P. Benda
New electrical steel strip grades in Czechoslovakia 225

Saito, A., K.-i. Yamamoto, K. Ishiyama and K.-i. Arai
Effect of stress on tertiary recrystallized silicon iron 229

Ibarrondo, I., S. Suriñach and J. González
Influence of manufacturing process parameters on magnetic characteristics of high-FeSi crystalline rapidly quenched ribbons 232

Hesske, R.-R. and N. Hildebrand
Magnetic measurements of losses in FeSi sheets 235

Takada, S. and T. Sasaki
Relaxation phenomena in dynamic magnetization processes of electrical iron sheets 239

Salz, W. and K.A. Hempel
Magnetic properties of Staboperm 242

Monstadt, H., E. Hornbogen and J. Rohde
The effect of heat treatment on microstructures of melt-spun Fe 6.5 wt% Si alloys 245

Soiński, M.
Phenomenon of anisotropy in Fe-based commercial soft magnetic materials 251

Chapter 4. Amorphous and microcrystalline materials and their application

Molotilov, B.V. and V.V. Sadchikov
Amorphous soft magnetic materials and their application (*Invited paper*) 253

Herzer, G.
Nanocrystalline soft magnetic materials (*Invited paper*) 258

Müller, M., N. Mattern and L. Illgen
The influence of different Cu/Nb contents on the structure and on the magnetic properties in nanocrystalline FeBSi base alloys 263

Meydan, T., M. Goktepe, A. Honda and N. Derebasi
Influence of bending stress on domain motion in amorphous material based magneto-elastic transducers 269

Fiorillo, F. and C. Appino
Static and dynamic losses in amorphous alloys versus peak induction and applied stress 272

Kraus, L., K. Závěta, O. Heczko, P. Duhaj, G. Vlasák and J. Schneider
Magnetic anisotropy in as-quenched and stress-annealed amorphous and nanocrystalline $Fe_{73.5}Cu_1Nb_3Si_{13.5}B_9$ alloys 275

Saito, A., K.-i. Yamamoto and O. Kunimori
Effect of stress on amophous bent cores 278

Ślawska-Waniewska, A., A. Siemko and H.K. Lachowicz
Remarks on stress-anneal-induced anisotropy in metallic glasses 281

Pott-Langemeyer, M., W. Riehemann and W. Heye
Magnetization processes in annealed Fe6.5wt%Si meltspun ribbons 284

Guo, H.-Q., T. Reininger, H. Kronmüller, M. Rapp and V.H. Skoumryev
Analysis of magnetization processes in nanocrystalline FeCoZr ferromagnets 287

Makarov, V.A., M.A. Archishevskii, U.A. Baldokhin, E.I. Maltsev, A.J. Zaitcev, V.V. Sadchikov, V.P. Ovcharov and V.V. Sosnin
The structure, phase composition and the properties of nanocrystalline magnetic alloys. Mössbauer, electron-microscopic and the magnetic investigation 290

Hamdi, E.S. and G.H. Shirkoohi
The effect of mechanical vibration on the magnetic properties of amorphous cores 293

Sovák, P., M. Konč and P. Kollár
The influence of annealing on the structural and magnetic properties of the amorphous $Co_{1-x}Cr_x$ thin films 296

Polak, C., R. Grössinger, H. Sassik, G. Herzer, E. Pulido and A. Hernando
Magnetic properties of recrystallized amorphous $Fe_{76}Si_{12}B_{12}$ and $Fe_{80}B_{20}$ ribbons 299

Tanaka, S., Z. Diao, T. Sugimoto and K. Narita
Solid state amorphization of Fe- and Co-based alloys and their magnetic properties 302

Vojtaník, P., O. Duša, J. Degro and M. Konč
AC permeability and other properties of annealed FeSiBCuNb amorphous alloy 305

López-Quintela, M.A., J. Rivas, R.J. Duro, I. Winter and M.G. Bonome
Structural and magnetic properties of FeB-based amorphous powders 307

Kaczkowski, Z.
Influence of annealing between Curie and crystallization temperatures on magnetomechanical coupling in $Fe_{80}B_{12}Si_8$ metallic glass 310

Zbroszczyk, J., W. Ciurzyńska, B. Wysłocki, S. Szymura, J. Świerczek, J. Rasek, M. Baran and K. Narita
Magnetic properties of amorphous ribbons after surface and heat treatment 313

Kaczkowski, Z. and P. Duhaj
Influence of the annealing time and temperature on magnetomechanical coupling in $Fe_{68}Co_{17}B_{15}$ metallic glass 315

Kaczkowski, Z., É. Kisdi-Koszó and L. Potocký
Influence of the casting in magnetic field and of annealing history on the elasticity moduli in the $Fe_{79}Cr_{6.6}B_{14.4}$ metallic glass 317

Kaczkowski, Z. and M. Müller
Dependence of magnetomechanical coupling on magnetic bias field in $Fe_{73.5}Cu_1Nb_3Si_{16.5}B_6$ metallic glass before nanocrystallization 320

Małkiński, L., Z. Kaczkowski and B. Augustyniak
Application of Barkhausen effect measurements in piezomagnetic study of metallic glasses 323

Nafalski, A., A. Wac-Włodarczyk and H. Stryczewska
Metallic glass cores for airborne equipment 325

Varga, L.K., É. Kisdi-Koszó and A. Lovas
T_c measurement with high heating rate (100 K/s) on binary Fe–B glassy alloys 328

Petrovič, P., I. Brovko, T. Zemčík, M. Zatroch, M. Konč, T. Švec and M. Dubovinský
Fine grain structure formation in the FeCuNb(Mo, W, Zr)SiB alloys 331

Zatroch, M., P. Petrovič, I. Brovko, T. Švec and M. Konč
Influence of hydrogenation on the magnetic properties of amorphous Fe–Co–Zr alloys 334

Alves, F. and J.C. Perron
Influence of annealing treatments on permeability aftereffects in some iron- or cobalt-based amorphous alloys 337

Zbroszczyk, J., W. Ciurzyńska, B. Wysłocki, S. Szymura, J. Świerczek, Y. Yamashiro and K. Narita
Effect of external tensile stresses on some magnetic properties of rapidly quenched ribbons 341

Meydan, T. and M.S.M. Elshebani
Displacement transducers using magnetostrictive delay line principle in amorphous materials 344

Pócsik, I., L.K. Varga, A. Lovas and T. Tarnóczi
Influence of annealing on the ferro–paramagnetic transition in Fe–B metallic glass 347

Schönhuber, P., H. Pfützner, G. Harasko, T. Klinger and K. Futschik
Main domains and surface domains in amorphous soft magnetic materials 349

Löffler, F., I.B. Kekalo and S. Roth
The kinetics of formation of an anisotropy by surface crystallization in an iron-based amorphous alloy 353

Sasaki, T., S. Takada, F. Tokutake and T. Sato
Stress dependence of ac magnetic properties in thick amorphous ribbons 356

Butvin, P., M. Hlásnik, P. Duhaj, B. Butvinová, K. Závěta, L. Kraus and K. Jurek
As-cast anisotropy of amorphous CoFeCrBSi and FeNbCuSiB 359

Müller, M., L. Illgen, M. Barth and H. Grahl
The influence of carbon content and casting temperature on the properties of $Fe_{79}B_{14}Si_7$ amorphous ribbons 363

Daróczi, Cs.S., G. Serfőző and P. Kollár
Ion implantation induced effects in surface properties of $Fe_{85}B_{15}$ metallic glass 367

Müller, K.-H. and M. Müller
The remanence of nanocrystalline Fe(Cu, Nb)BSi alloys 369

Chapter 5. Soft ferrites and other alloys

Zenger, M.
New developments in the field of soft magnetic ferrites (*Invited paper*) 372

Müller, K.-H., D. Eckert, P. Nothnagel and A. Handstein
Soft magnetic properties of NdFeB magnets 377

Dietzmann, G. and M. Schaefer
On the frequency dependence of power losses in soft magnetic materials 380

Blythe, H.J. and H. Kronmüller
Magnetic aftereffects in irradiated Pd_3Fe 383

Hisatake, K., I. Matsubara, K. Maeda, H. Wakao, T. Fujihara, Y. Kawai and K. Uematsu
Gamma-ray-induced disaccommodation of permeability in single crystal of yttrium iron garnet 387

Klugmann, E., J. Pastor and H.J. Blythe
Magnetic and anelastic relaxation in equi-atomic FePd alloys during ordering 389

Nakagawa, S., T. Hamaguchi and M. Naoe
High permeability of iron-nitride films prepared by ion beam deposition using NH_3 392

Walz, F., H.J. Blythe and H. Kronmüller
Small C– and N–vacancy complexes in irradiated α-Fe 395

Chapter 6. Magnetic circuits and transformers

Pfützner, H.
Performance of new materials in transformer cores (*Invited paper*) 399

Basak, A. and A. Aram Bonyar
Effects of transformer core assembly on building factors 406

Ardebili, M. and A.J. Moses
Investigation of surface scratched silicon steels in three-phase stacked model transformer cores 409

Valkovic, Z. and A. Rezic
Improvement of transformer core magnetic properties using the step-lap design 413

Shirkoohi, G.H.
Prediction of improvement in efficiency of induction machines by replacing the core materials using FEM technique 416

Bessho, K., S. Yamada, M. Nakano and K. Nakamoto
A new flux concentration type electromagnetic pump for FBR 419

Szczyglowski, J.
Amorphous ribbons in summation transformers in earth leakage circuit breakers 423

Basak, A. and F.J. Anayi
Construction of a NdFeB magnet brushless dc linear motor and its static and dynamic characteristics 426

Simonen, S.A.E. and A. Basak
Use of NdBFe magnets in audio deck sliders 429

Hirata, T. and M. Naoe
Improvement in soft magetism of Sendust sputtered films for high performance MIG head 432

Moses, A.J. and H. Rahmatizadeh
Economic aspects of minimising the effects of mechanical stress in induction motor stator cores 435

Naoe, M., K. Kubota and S. Nakagawa
Preparation of soft magnetic films by mechanical alloying of Fe/Si/Al multilayers under Ar ion bombardment 439

Chapter 7. Mathematical modelling and finite element analysis

Benda, O.
Possibilities and limits of the Preisach model (*Invited paper*) 443

Olszewski, P., T. Nakata, N. Takahashi and K. Fujiwara
Numerical model for soft anisotropic materials and its experimental verification 447

Juszczyk, S.
Classification of exchange in chromium compounds with non-linear spin structure 449

Shirkoohi, G.H.
Finite element solution of single phase induction machine cores constructed from anisotropic non-oriented steels 451

Waeckerlé, Th., B. Cornut, A. Lebouc and J.C. Perrier
Model of approach to saturation for textured steels 454

Shirkoohi, G.H. and J. Liu
Field computation of three phase three limb and three phase five limb transformer cores constructed from amorphous material 457

Basak, A. and R. Nourizadeh
Microprocessor evaluation of magnetic properties of silicon–iron using a novel Fourier algorithm 460

Binner, A. and H. Hemschik
The influence of eddy currents on the behaviour of electromechanical actuators 463

Iwahara, M., H. Muramoto and Y. Hondou
Analysis of a three-phase ferro-resonant voltage stabilizer using nonlinear phasor tableau method 466

Benda, O. and J. Bydžovský
AC-remanence states as identification criterion of hysteresis modeling 469

Alexeev, A.G., T.G. Bez'jazykova and A.Ye. Kornyev
Interaction physics of magnetic elastomers with electromagnetic fields 473

Berthault, A., D. Rousselle and G. Zerah
Magnetic properties of Permalloy microparticles 477

Author index to volume 112 481

Subject index to volume 112 489